

filled with mercury, one limb dipping into a vessel of mercury, *a*, and the other into a bath of dilute acid, *b*, the level of the mercury being considerably higher than that of the acid. The mercury is prevented from syphoning over by drawing out the end, *h*, of the syphon into a capillary tube. A contact is sealed into the top of the syphon at *i* and a second contact is made to the acid at *j*. When a difference of potential is set up between *i* and *j* in such a direction that *i* is positive to *j*, the capillary forces are overcome and the mercury syphons over; in so doing the mercury as it flows out of *h* falls on to a delicately balanced lever, *k*, which is thereby tilted and makes contact with a stop, *o*, thus closing a local relay circuit. The level of the mercury in *a* is maintained constant by means of the arrangement shown to the right of the syphon; a reservoir, *s*, is partly filled with mercury, which is held up by keeping a partial vacuum in *r*; when the level in *a* sinks the end, *u*, of the side tube, *t*, is opened, thus allowing a certain amount of air to enter and causing mercury to flow out until it again closes the aperture.

In a modification which has been devised the lever is arranged outside and beneath the vessel *b*, which is then provided with a capillary hole at the bottom just above the end of the lever. The bottom of the vessel is in this case covered with mercury, over which acid is poured

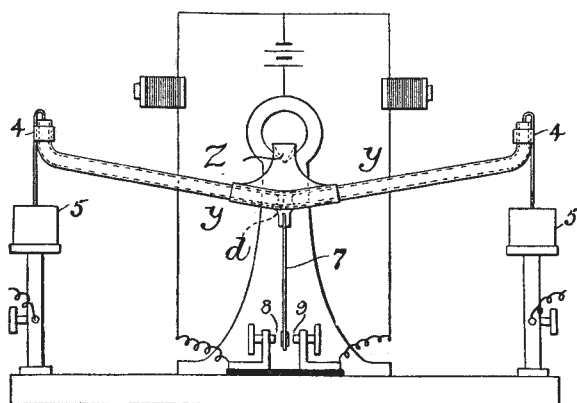


FIG. 2.—"Armor" Electro-capillary Relay. Balance form.

until the forces of gravity and capillarity are just balanced. When more mercury syphons over a corresponding amount escapes through the hole in the bottom of *b* and actuates the lever. The lever may here be replaced by two platinum points, the falling mercury being then made to bridge the gap between the points and thus complete the relay circuit.

An alternative form of the apparatus is shown in Fig. 2. A glass tube, *y*, is balanced on a knife edge, *z*, and is filled with mercury except for a drop of acid in the centre at *d*. The current is led into this tube through metal rods, 4, 4, dipping into mercury cups, 5, 5. If a current is passed through the tube the meniscus between the mercury and acid is displaced in the direction of the current and the balance is consequently disturbed, as one arm now contains more mercury than the other; the pointer, 7, is deflected and makes contact with either the stop 8 or 9 and thus closes the local circuit. The construction is, however, said not to be so satisfactory as that shown in Fig. 1. It is claimed that the apparatus is extremely sensitive and very trustworthy in its action, and even that it could be used as a substitute for the coherer in ætheric telegraphy or the syphon recorder in cable work; but these claims remain to be established in practice.

### THE OASIS OF KHARGA.<sup>1</sup>

DURING the last few years the Survey Department of the Public Works Ministry of Egypt has shown considerable activity in the prosecution of investigations connected with the geological survey of the valley of the Nile, and the publications which it issues from time to time show that the results which it obtains from them are of great interest and importance. Until comparatively recently the conclusions formed about the stratification of Egypt and its past geological history were based upon researches which were undertaken without sufficient preparation, often indeed without sufficient knowledge on the part of those who made them, and the statements made on the subject were often confusing and sometimes contradictory. Under the direction of Sir W. Garstin, however, things have taken a turn for the better, and the geological publications prepared with his sanction and approval really help to put our knowledge of the geology of Egypt upon a sure base.

The publication before us, by Mr. John Ball, is interesting from every point of view and reflects great credit upon the department to which he belongs. There is much in it, of course, which will appeal only to the engineer and geologist who are concerned with the practical administration of the district of the Oasis of which it treats, but there is also much which will claim the careful attention of the archaeologist and antiquary. The work is divided into four chapters, which treat of the surveying methods employed and their general results, of the roads between the Nile Valley and the Kharga Oasis, and of the topography and geology of the Oasis; besides these we have an introductory chapter, five appendices, nineteen maps and plates, and sixteen illustrations. The book is satisfactory because it tells us, not only what are the results which have been obtained, but also *how* they have been arrived at, and the plans, maps, and illustrations enable the reader to follow these results with ease.

The Oasis of Kharga has been a source of wonder to untold generations of men, and the curiosity of all cultivated students has been roused more and more as each traveller has returned from it and unfolded in his written descriptions of the place stories of its people and antiquities. Concerning the origin of the Oasis experts are in doubt, but Mr. Ball thinks that its whole area has undergone disturbance which has resulted in folding and faulting; and since the faults affect the highest rocks on the plateaux, it is clear that they took place since the deposition of all the strata which are now found in the Oasis, the calcareous tufa, of course, excepted. The date of the folding and faulting cannot be fixed precisely; all that can be said from the examination of the Oasis itself is that it took place since Lower Eocene times. It is possible that it may be connected with some younger faulting seen in the Nile Valley at the First Cataract, but we have as yet insufficient information for a definite connection of this faulting with the folding of the strata in the Oases. The faulting produced much cleaving and crushing of the rocks, but we have to find out what was the particular agency which excavated and carried away the cracked-up limestones, and to account for disintegration and removal of hundreds of cubic miles of limestone rock, some of it being of considerable hardness. It is probable that the excavation was begun by the action of water, and that after this ceased, owing to a total change in the climatic conditions, *i.e.*, the change from a moist climate to a dry one in Egypt, the work was continued and is still going on by the agency of wind and sand. The superficial erosion both of the Oasis and of the hills within and round about it is due to wind-borne sand, but this has never been realised by travellers, for they have usually visited

<sup>1</sup> "Kharga Oasis; its Topography and Geology." By J. Ball. (Cairo, 1900.) Pp. 82.

the Oasis in the calm winter and spring months. Even at the present day the Oasis is enlarging its boundary, and the surface of the plateau is being ground away by sand, and the underlying clays on the faces of the scarps are being steadily excavated. The water in the Oasis is derived from the rainfall of the highlands in the interior of Africa, which, coming by way of the permeable underground strata, appears where these strata rise to the surface or are pierced by wells, though strangely enough the wells are chiefly on the down-throw side of the fault, *i.e.* to the eastward of it.

The history of the Oasis of Kharga in its relation to Egyptian history is full of interest in every way. That it was well known to the Egyptians under the Early Empire is tolerably certain, for from the inscription of the officer Una who made expeditions into the deserts of Libya and the Sûdân we know that the tribes of the districts in the neighbourhood of it were in the habit of waging war against each other. Under the eighteenth dynasty the Oasis of the North and the Oasis of the South were subject to the great kings Thothmes III. and Amenhetep III., and there is no doubt that a considerable trade between them and Egypt was in existence in still earlier times. Every now and then the tribes revolted against the rule of Egypt, but their triumph was short-lived, for Egyptian soldiers appeared and the rebellion was stamped out in a peculiarly firm manner, and the trees were cut down and the gardens destroyed. In the twenty-second dynasty the Oases were still reckoned as a part of Egypt, and under the Persians Kharga was chosen by Darius I. as the site of the fine temple which he built there; this temple was finished by Darius II., and must have been, judging by its present remains, a striking and a remarkable object. It is curious to note that the Egyptians at one time believed that the souls of the dead made their way to the Oases, and it is obvious that the green fields and gardens full of vines and palm trees easily connected themselves in their minds with the Elysian Fields, wherein every Egyptian hoped eventually to live. Before the end of the twenty-sixth dynasty Kharga was used as a place of banishment for criminals and evil doers, and the Romans found it necessary to maintain a garrison at Hibis, the chief city of the Oasis, to keep order. Christianity was introduced into the Oasis by one of the Apostles, who is said to have died and been buried there, and when Nestorius was banished there A.D. 435 he found flourishing Christian communities at several places in the Oasis who would, no doubt, accord him a far from hearty welcome.

Mr. Ball has consulted the works of travellers such as Cailliaud and Hoskins, Rohlf's and Brugsch, and although he has little new to say about the temples and other buildings which they described, his notes on the temples of Hibis, Nadura, Kasr al-Guehda, Kasr Zaiyân, Kasr Dûsh, or Kysis, are most useful, especially as they are accompanied by clear plans. His remarks on the Christian antiquities are somewhat meagre, but then he is an engineer and not an archæologist. In the next edition of his work the paragraph on p. 78 in which he states that the Christian tombs are those of the followers of Nestorius should be modified, for we know on the authority of Christian tradition and writings that there were several congregations of Christians in the Oasis of Kharga one or two centuries before the time of Nestorius, and it is evident that they must have left graves behind them. The tombs may then as well belong to the third and fourth as to the fifth and sixth centuries; and seeing that Nestorius was a violent opponent of the Monophysites in Egypt, it is more than doubtful if he had any followers at all among the Jacobite Christians of Kharga. But these considerations in no way affect the value of Mr. Ball's engineering work, though they do show that an engineer is not also necessarily an archæologist.

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SIR WILLIAM MACCORMAC, BART., K.C.B.,  
K.C.V.O.

SIR WILLIAM MACCORMAC, whose death occurred suddenly and unexpectedly on the morning of December 4 at Bath, where he had gone for treatment of an illness which his intimate friends, although feeling considerable anxiety on his behalf, little thought would end so tragically, was one of the most prominent figures in the medical profession in London. He was the son of a well-known Belfast physician, Dr. Henry MacCormac, the author of such philosophical works as "The Philosophy of Human Nature," published in 1837, and "Aspirations from the Inner Life," in 1860, as well as of works on the nature, treatment and prevention of consumption, which attracted much attention at the time and have come again into notice recently as having anticipated the modern doctrine of the open-air treatment of tubercular disease. Sir William MacCormac was born in Belfast on January 17, 1836; he was educated in his native city and graduated as M.A. of the Queen's University of Ireland in 1858. He subsequently studied medicine in Dublin and Paris and became a Fellow of the Royal College of Surgeons, Ireland, in 1864, entering at the same time into the active work of his profession as surgeon to the Royal Belfast Hospital, a post which he held until 1870.

On the outbreak of the Franco-German war he returned to Paris and offered his services to the French Red Cross Society, "*La Société de Secours aux blessés militaires*." His offer was accepted and he was ordered to Metz, where he was taken prisoner, released and sent back to Paris. It was then that, along with Mr. Furley, now Sir John Furley, and Dr. Philip Frank, he came in contact with Dr. Marion Sims and other Americans (who had come over with a large quantity of material, but with little or no funds), and established the Anglo-American Ambulance with the financial assistance of the National Aid Society, which had been formed in London at the beginning of the war. The Ambulance proceeded at once to Sedan under the charge of Dr. Marion Sims, with MacCormac as second in command, and arrived there in time to take an active and prominent part in the decisive battle of the campaign. At Sedan MacCormac was in his element, and it was there that he laid the foundation of his future greatness. His "Notes and Recollections of an Ambulance Surgeon," published in 1871, vividly described his experiences of the battle and the absorbing, incessant work of a surgeon in the midst of carnage. The book has been translated into German, French, Dutch, Italian, Russian and Japanese, and has made his name a household word amongst the military surgeons of Europe. When the pressure of the work in Sedan was over MacCormac returned to England, and with the assistance of the influential committee of the National Aid Society was appointed to the staff of St. Thomas's Hospital, which had just been opened. He took the Fellowship of the Royal College of Surgeons, England, at the same time, and remained associated with St. Thomas's in the varying capacities of assistant surgeon, surgeon and lecturer on surgery in the medical school, and consulting surgeon and Emeritus lecturer on clinical surgery. He also held many other consulting appointments in London and was examiner in connection with the naval and military medical services.

His reputation as an authority on gunshot wounds was not allowed to lapse for want of opportunity. In 1876 he accompanied the late Lord Wantage, then Colonel Loyd-Lindsay, to Alexinatz during the war between Servia and Turkey. His period of stay at the seat of war was, however, brief, as he and his companion were obliged to take flight with the retreating army. In 1899 he was appointed a consulting surgeon to the field force in South Africa, and saw much of the results of the earlier and fiercer struggles of the war.